CLAIMS

1. A hydraulic actuator device, comprising:

a piston within a cylinder, the cylinder having a first fluid port in fluid communication with an open side of the piston, and a second fluid port in fluid communication with a shaft side of the piston, the piston configured to travel in a first direction, toward the shaft side of the piston and in a second direction, toward the open side of the piston; and

a valve circuit configured to selectively couple the first fluid port with a high-pressure fluid source when piston travel in the first direction is desired, and with a low-pressure fluid source when piston travel in the second direction is desired, the valve circuit further configured to couple the second fluid port to the high-pressure fluid source when piston travel is desired in the first or second direction, and the valve circuit also configured to close the second fluid port when no piston travel is desired.

2. The hydraulic actuator device of claim 1 wherein the valve circuit is further configured to close the first fluid port when no piston travel is desired.

3. The hydraulic actuator device of claim 1 wherein the valve circuit comprises a spool valve having first and second control ports coupled to the first and second fluid ports, respectively, the spool valve being configured to place the first and second control ports in fluid communication with the high-pressure fluid source when a spool of the spool valve is in a first position, the spool valve being configured to close the second control port when the spool is in a second position, and the spool valve being configured to place the first control port in fluid communication with the low-pressure fluid source and the second control port in fluid communication with the high-pressure fluid source when the spool is in a third position.

4. The hydraulic actuator device of claim 3 wherein the spool valve is further configured to close the first control port when the spool is in the second position.

5. The hydraulic actuator device of claim 3, further comprising a feedback mechanism configured to apply biasing force to the spool in a direction toward the first position, piston travel in the second direction tending to increase the biasing force and piston travel in the first direction tending to decrease the biasing force.

6. The hydraulic actuator device of claim 5 wherein the feedback mechanism is a mechanical linkage configured to vary biasing force against a spring coupled to the spool.

7. The hydraulic actuator device of claim 5 wherein the feedback mechanism is an electro-mechanical linkage comprising:

a position sensor configured to sense a position of the piston; and

a solenoid coupled to the spool, configured to vary biasing force against the spool according to the sensed position of the piston.

8. The hydraulic actuator device of claim 1, further comprising high and low-pressure fluid sources each coupled to the valve circuit.

9. The hydraulic actuator device of claim 1, further comprising a solenoid configured to variably apply biasing force to the spool to urge the spool from the first position toward the second, and from the second position toward the third position, according to a voltage level at an input of the solenoid.

10. A hydraulic spool valve for controlling a linear actuator, comprising:

first and second control ports configured to be coupled to first and second fluid ports of the actuator, respectively;

a spool configured to travel between first, second, and third spool positions, the spool valve being configured to place the first and second control ports in fluid communication with the high-pressure fluid source when the spool is in the first position, the spool valve being configured to close the second control port when the spool is in the second position, and the spool valve being configured to place the first control port in fluid communication with a low-pressure fluid source and the second control port in fluid communication with a high-pressure fluid source when the spool is in the third position.

11. The hydraulic spool valve of claim 10 further comprising first and second pressure fluid ports configured to be coupled to the high and low-pressure fluid sources, respectively.

12. The hydraulic spool valve of claim 11 further comprising a third pressure fluid port configured to be coupled to the high-pressure fluid source.

13. A system, comprising:

a pump/motor configured to have a displacement directly related to a stroke angle of a cylinder barrel relative to a drive plate;

an actuator coupled to the cylinder barrel and configured to vary the stroke angle thereof according to a position of a shaft of the actuator, the actuator having a piston coupled to the shaft, the piston configured to move within a cylinder in response to differential pressure acting on first and second surfaces thereof; and

a valve configured to couple a high-pressure fluid source to the actuator such that high-pressure fluid is made to act on the first and second surfaces of the piston when movement of the shaft in a first direction is desired, the valve configured to couple the high-pressure fluid source and a low pressure fluid source to the actuator such that high-pressure fluid is made to act on the first surface of the piston while low-pressure fluid is made to act on the second surface of the piston when movement of the

shaft in a second direction is desired, and the valve configured to decouple the high and low-pressure fluid sources from the actuator when no movement of the shaft is desired.

14. The system of claim 13 wherein the actuator is coupled to the cylinder barrel such that movement of the shaft in the first direction causes the cylinder barrel to rotate in a direction that reduces the angle of the cylinder barrel relative to the drive plate, while movement of the shaft in the second direction causes the cylinder barrel to rotate in a direction that increases the angle of the cylinder barrel relative to the drive plate.

15. The system of claim 13, further comprising a high-pressure accumulator configured to serve as the high-pressure fluid source, and a low-pressure accumulator configured to serve as the low-pressure fluid source.

16. The system of claim 13, further comprising a vehicle having a drivetrain coupled to an output shaft of the pump/motor and configured to receive motive force therefrom.

17. A method, comprising:

applying high pressure to first and second surfaces of a piston coupled to a shaft of an actuator to move the shaft in a first direction;

applying high pressure to the first surface and low pressure to the second surface of the piston to move the shaft in a second direction; and

shutting off pressure access to the first and second surfaces of the piston to arrest the actuator.

18. The method of claim 17, further comprising rotating an axis of a pump/motor barrel in a third direction relative to a drive plate of the pump/motor by

moving the shaft in the first direction, and rotating the axis of the pump/motor barrel in a fourth direction relative to the drive plate by moving the shaft in the second direction.

19. The method of claim 18, further comprising decreasing a rate of energy transfer between a high-pressure source and an output shaft of the pump/motor by rotating the axis of the pump/motor barrel in the third direction relative to the drive plate, and increasing the rate of energy transfer between the high-pressure source and the output shaft of the pump/motor by rotating the axis of the pump/motor barrel in the fourth direction relative to the drive plate.

20. The method of claim 19, further comprising adjusting motive power to a vehicle by selectively increasing or decreasing energy transfer between the high-pressure source and the output shaft of the pump/motor.